
SL Paper 1

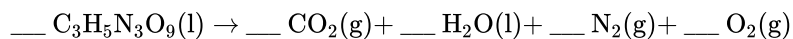
Which sample has the greatest mass?

- A. 1 mol of SO_2
 - B. 2 mol of N_2O
 - C. 2 mol of Ar
 - D. 4 mol of NH_3
-

What is the total number of atoms in 0.100 mol of $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$?

- A. 11
 - B. 6.02×10^{22}
 - C. 3.01×10^{23}
 - D. 6.62×10^{23}
-

Nitroglycerine, $\text{C}_3\text{H}_5\text{N}_3\text{O}_9$, can be used in the manufacture of explosives. What is the coefficient of $\text{C}_3\text{H}_5\text{N}_3\text{O}_9(\text{l})$ when the equation for its decomposition reaction is balanced using the lowest whole numbers?



- A. 2
 - B. 4
 - C. 20
 - D. 33
-

4.00 mol of a hydrocarbon with an empirical formula of CH_2 has a mass of 280 g. What is the molecular formula of this compound?

- A. C_2H_4
 - B. C_3H_6
 - C. C_4H_8
 - D. C_5H_{10}
-

The volume occupied by one mole of an ideal gas at 273 K and 1.01×10^5 Pa is 22.4 dm^3 . What volume, in dm^3 , is occupied by $3.20 \text{ g O}_2(\text{g})$ at 273 K and 1.01×10^5 Pa?

- A. 2.24
 - B. 4.48
 - C. 22.4
 - D. 71.7
-

1.0 dm^3 of an ideal gas at 100 kPa and 25°C is heated to 50°C at constant pressure. What is the new volume in dm^3 ?

- A. 0.50
 - B. 0.90
 - C. 1.1
 - D. 2.0
-

In which mixture is NaOH the limiting reagent?

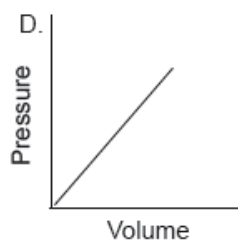
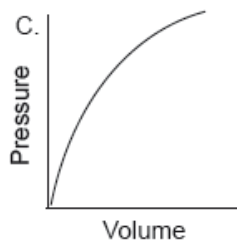
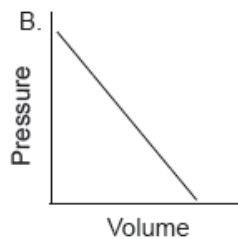
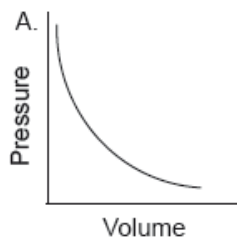
- A. $0.20\text{mol NaOH} + 0.10\text{mol H}_2\text{SO}_4$
 - B. $0.10\text{mol NaOH} + 0.10\text{mol H}_2\text{SO}_4$
 - C. $0.20\text{mol NaOH} + 0.10\text{mol HNO}_3$
 - D. $0.10\text{mol NaOH} + 0.10\text{mol HNO}_3$
-

What is the percentage yield when 2.0 g of ethene, C_2H_4 , is formed from 5.0 g of ethanol, $\text{C}_2\text{H}_5\text{OH}$?

$M_r(\text{ethene}) = 28$; $M_r(\text{ethanol}) = 46$

- A. $\frac{2.0}{28} \times \frac{5.0}{46} \times 100$
 - B. $\frac{\frac{2.0}{28}}{\frac{5.0}{46}} \times 100$
 - C. $\frac{28}{2.0} \times \frac{5.0}{46} \times 100$
 - D. $\frac{\frac{28}{2.0}}{\frac{5.0}{46}} \times 100$
-

Which graph shows the relationship between the volume and pressure of a fixed mass of an ideal gas?



How many molecules are present in a drop of ethanol, $\text{C}_2\text{H}_5\text{OH}$, of mass $2.3 \times 10^{-3} \text{ g}$? ($L = 6.0 \times 10^{23} \text{ mol}^{-1}$)

- A. 3.0×10^{19}
- B. 3.0×10^{20}
- C. 6.0×10^{20}
- D. 6.0×10^{26}

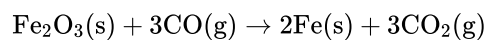
What is the total number of nitrogen atoms in **two** mol of NH_4NO_3 ?

- A. 4
- B. 6.02×10^{23}
- C. 1.20×10^{24}
- D. 2.41×10^{24}

Which statements about solutions are correct?

- I. A solute dissolves in a solvent to form a solution.
 - II. A solution is a homogeneous mixture of two or more substances.
 - III. Concentrations of solutions can be expressed in g dm^{-3} .
- A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II and III

The equation for the reduction of iron(III) oxide is:



What mass of carbon dioxide, in g, is produced by the complete reduction of 80 g of iron(III) oxide?

- A. 44
 - B. 66
 - C. 88
 - D. 132
-

What is the number of ions in 0.20 mol of $(\text{NH}_4)_3\text{PO}_4$?

- A. 8.0×10^{-1}
 - B. 1.2×10^{23}
 - C. 4.8×10^{23}
 - D. 2.4×10^{24}
-

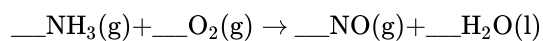
A sample of element X contains 69% of ^{63}X and 31% of ^{65}X . What is the relative atomic mass of X in this sample?

- A. 63.0
 - B. 63.6
 - C. 65.0
 - D. 69.0
-

What is the concentration of NaCl, in mol dm^{-3} , when 10.0 cm^3 of $0.200 \text{ mol dm}^{-3}$ NaCl solution is added to 30.0 cm^3 of $0.600 \text{ mol dm}^{-3}$ NaCl solution?

- A. 0.450
 - B. 0.300
 - C. 0.500
 - D. 0.800
-

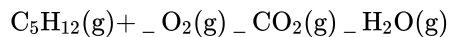
What is the whole number ratio of the coefficients of ammonia to oxygen when the following equation is balanced correctly?



- A. 1 : 2

- B. 2 : 1
 - C. 4 : 5
 - D. 5 : 4
-

What is the coefficient for $\text{O}_2(\text{g})$ when the equation for the combustion of 1 mole of pentane is balanced?



- A. 5
 - B. 6
 - C. 8
 - D. 16
-

What is the pressure, in Pa, in a 100 cm^3 container containing 1.8 g of steam at a temperature of 727°C ? ($R = 8.31 \text{ J K}^{-1} \text{ mol}^{-1}$)

- A. $\frac{1.8 \times 8.31 \times 727}{18 \times 100}$
 - B. $\frac{18 \times 100}{1.8 \times 8.31 \times 727}$
 - C. $\frac{1.8 \times 8.31 \times 1000}{18 \times 10^{-4}}$
 - D. $\frac{1.8 \times 8.31}{1.8 \times 10^{-4} \times 1000}$
-

The relative molecular mass of a gas is 56 and its empirical formula is CH_2 . What is the molecular formula of the gas?

- A. CH_2
 - B. C_2H_4
 - C. C_3H_6
 - D. C_4H_8
-

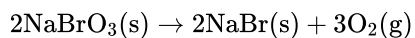
What is the molar mass, in g mol^{-1} , of a substance if 0.30 mol of the substance has a mass of 18 g?

- A. 5.4
 - B. 6.0
 - C. 30
 - D. 60
-

1.7 g of NaNO_3 ($M_r = 85$) is dissolved in water to prepare 0.20 dm^3 of solution. What is the concentration of the resulting solution in mol dm^{-3} ?

- A. 0.01
 - B. 0.1
 - C. 0.2
 - D. 1.0
-

When sodium bromate(V), NaBrO_3 , is heated, it reacts according to the equation below.



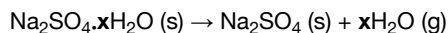
What amount, in mol, of NaBrO_3 produces 2.4 dm^3 of oxygen gas, measured at room temperature and pressure? (Molar volume of gas = $24 \text{ dm}^3 \text{ mol}^{-1}$ at room temperature and pressure.)

- A. 0.017
 - B. 0.067
 - C. 0.10
 - D. 0.15
-

Which contains the largest number of ions?

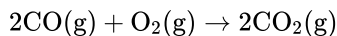
- A. 1 mol of $\text{Al}_2(\text{SO}_4)_3$
 - B. 1 mol of $\text{Mg}_3(\text{PO}_4)_2$
 - C. 2 mol of K_3PO_4
 - D. 3 mol of NaNO_3
-

What is the value of x when 32.2 g of $\text{Na}_2\text{SO}_4 \cdot x\text{H}_2\text{O}$ are heated leaving 14.2 g of anhydrous Na_2SO_4 ? $M_r(\text{H}_2\text{O}) = 18$; $M_r(\text{Na}_2\text{SO}_4) = 142$.



- A. 0.1
 - B. 1
 - C. 5
 - D. 10
-

5 dm^3 of carbon monoxide, $\text{CO}(\text{g})$, and 2 dm^3 of oxygen, $\text{O}_2(\text{g})$, at the same temperature and pressure are mixed together. Assuming complete reaction according to the equation given, what is the maximum volume of carbon dioxide, $\text{CO}_2(\text{g})$, in dm^3 , that can be formed?



- A. 3
 - B. 4
 - C. 5
 - D. 7
-

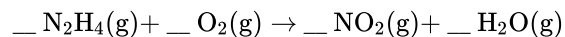
What will be the concentration of sulfate ions in mol dm^{-3} when 0.20 mol of $\text{KAl}(\text{SO}_4)_2$ is dissolved in water to give 100 cm^3 of aqueous solution?

- A. 0.2
 - B. 1.0
 - C. 2.0
 - D. 4.0
-

On analysis, a compound with molar mass 60 g mol^{-1} was found to contain 12 g of carbon, 2 g of hydrogen and 16 g of oxygen. What is the molecular formula of the compound?

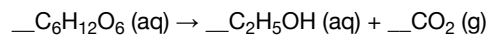
- A. CH_2O
 - B. CH_4O
 - C. $\text{C}_2\text{H}_4\text{O}$
 - D. $\text{C}_2\text{H}_4\text{O}_2$
-

What is the sum of the coefficients for the equation when balanced using the smallest possible whole numbers?



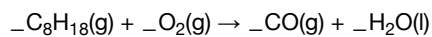
- A. 5
 - B. 6
 - C. 7
 - D. 8
-

What is the sum of the coefficients when the following equation is balanced using the smallest whole numbers?



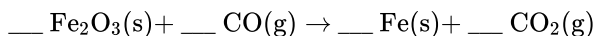
- A. 4
- B. 5
- C. 9
- D. 10

What is the sum of the coefficients when the equation is balanced with whole numbers?



- A. 26.5
 - B. 30
 - C. 53
 - D. 61
-

What is the sum of the coefficients when the following equation is balanced using whole numbers?



- A. 5
 - B. 6
 - C. 8
 - D. 9
-

Why do gases deviate from the ideal gas law at high pressures?

- A. Molecules have finite volume.
 - B. Cohesive forces increase the volume from the ideal.
 - C. Increasing pressure increases the temperature of the gas.
 - D. Collisions between molecules occur more frequently as pressure increases.
-

What volume, in m^3 , is occupied by 2.00 mol of gas at 27 °C and 2.00 atm pressure?

Assume: $1.00 \text{ atm} = 1.01 \times 10^5 \text{ Pa}$ and $R = 8.31 \text{ J K}^{-1} \text{ mol}^{-1}$.

- A. $\frac{8.31 \times 27}{1.01 \times 10^5}$
 - B. $\frac{2.00 \times 8.31 \times 27}{1.01 \times 10^5}$
 - C. $\frac{2.00 \times 8.31 \times 300}{2.00 \times 1.01 \times 10^5}$
 - D. $\frac{2.00 \times 8.31 \times 300}{1.01 \times 10^5}$
-

How many moles of oxygen atoms are there in 0.500 mol of hydrated iron(II) ammonium sulfate, $(\text{NH}_4)_2\text{Fe}(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}(\text{s})$?

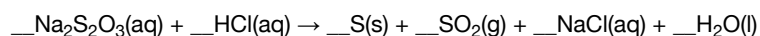
- A. 4.00

- B. 7.00
 - C. 8.00
 - D. 14.00
-

A fixed mass of gas has a certain volume at a temperature of 50 °C. What temperature is required to double its volume while keeping the pressure constant?

- A. 100 K
 - B. 323 K
 - C. 373 K
 - D. 646 K
-

What is the sum of the coefficients when the equation is balanced with the lowest whole number ratio?



- A. 6
 - B. 7
 - C. 8
 - D. 9
-

What is the number of atoms of oxygen in 2.0 mol of hydrated sodium carbonate, $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$? Avogadro's constant, L or N_A : $6.02 \times 10^{23} \text{ mol}^{-1}$

- A. 6
 - B. 26
 - C. 3.6×10^{24}
 - D. 1.6×10^{25}
-

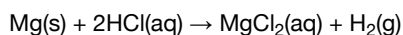
5.0 cm³ of 2.00 mol dm⁻³ sodium carbonate solution, $\text{Na}_2\text{CO}_3(\text{aq})$, was added to a volumetric flask and the volume was made up to 500 cm³ with water. What is the concentration, in mol dm⁻³, of the solution?

- A. 0.0050
 - B. 0.0040
 - C. 0.020
 - D. 0.010
-

What is the molecular formula of a hydrocarbon containing 84.6% carbon by mass with a molar mass of 142.3 g mol^{-1} ?

- A. $\text{C}_{20}\text{H}_{44}$
 - B. $\text{C}_{11}\text{H}_{10}$
 - C. $\text{C}_{10}\text{H}_{22}$
 - D. C_5H_{11}
-

What is the expression for the volume of hydrogen gas, in dm^3 , produced at STP when 0.30 g of magnesium reacts with excess hydrochloric acid solution?

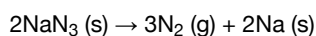


Molar volume of an ideal gas at STP = $22.7 \text{ dm}^3 \text{ mol}^{-1}$

- A. $\frac{0.30 \times 2 \times 22.7}{24.31}$
 - B. $\frac{0.30 \times 22.7}{24.31}$
 - C. $\frac{0.30 \times 24.31}{22.7}$
 - D. $\frac{0.30 \times 22.7}{24.31 \times 2}$
-

How many grams of sodium azide, NaN_3 , are needed to produce 68.1 dm^3 of N_2 (g) at STP?

Molar volume at STP = $22.7 \text{ dm}^3 \text{ mol}^{-1}$; $M_r(\text{NaN}_3) = 65.0$

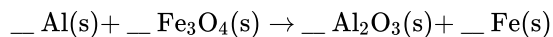


- A. 32.5
 - B. 65.0
 - C. 130.0
 - D. 195.0
-

Which compound has the greatest percentage by mass of nitrogen atoms?

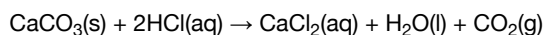
- A. N_2H_4
 - B. NH_3
 - C. N_2O_4
 - D. NaNO_3
-

What is the coefficient of Fe_3O_4 when the following equation is balanced using the lowest whole numbers?



- A. 2
 - B. 3
 - C. 4
 - D. 5
-

What is the maximum volume, in dm^3 , of $\text{CO}_2\text{(g)}$ produced when 1.00 g of $\text{CaCO}_3\text{(s)}$ reacts with 20.0 cm^3 of 2.00 mol dm^{-3} HCl(aq) ?



Molar volume of gas = 22.7 $\text{dm}^3 \text{mol}^{-1}$; $M_r(\text{CaCO}_3) = 100.00$

- A. $\frac{1}{2} \times \frac{20.0 \times 2.0}{1000} \times 22.7$
 - B. $\frac{20.0 \times 2.0}{1000} \times 22.7$
 - C. $\frac{1.0}{100.00} \times 22.7$
 - D. $\frac{1.0}{100.00} \times 2 \times 22.7$
-

The molar mass of a compound is approximately 56 g mol^{-1} . Which formula is possible for this compound?

- A. NaNO_3
 - B. AgOH
 - C. MgO
 - D. KOH
-

The volume of an ideal gas at 27.0 $^\circ\text{C}$ is increased from 3.00 dm^3 to 6.00 dm^3 . At what temperature, in $^\circ\text{C}$, will the gas have the original pressure?

- A. 13.5
 - B. 54.0
 - C. 327
 - D. 600
-

Which non-metal forms an oxide XO_2 with a relative molecular mass of 60?

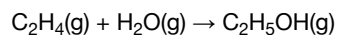
- A. C
- B. N
- C. Si
- D. S

Which equation represents sublimation?

- A. $2\text{Al(s)} + 3\text{I}_2\text{(g)} \rightarrow 2\text{AlI}_3\text{(s)}$
 - B. $\text{HgCl}_2\text{(s)} \rightarrow \text{HgCl}_2\text{(g)}$
 - C. $\text{I}_2\text{(g)} \rightarrow \text{I}_2\text{(s)}$
 - D. $\text{CaCO}_3\text{(s)} + 2\text{HCl(aq)} \rightarrow \text{CaCl}_2\text{(aq)} + \text{CO}_2\text{(g)} + \text{H}_2\text{O(l)}$
-

What is the percentage yield when 7 g of ethene produces 6 g of ethanol?

$M_r(\text{ethene}) = 28$ and $M_r(\text{ethanol}) = 46$



- A. $\frac{6 \times 7 \times 100}{28 \times 46}$
 - B. $\frac{6 \times 46 \times 100}{7 \times 28}$
 - C. $\frac{6 \times 28}{7 \times 46 \times 100}$
 - D. $\frac{6 \times 28 \times 100}{7 \times 46}$
-

What is the volume, in cm^3 , of the final solution if 100 cm^3 of a solution containing 1.42 g of sodium sulfate, Na_2SO_4 , is diluted to the concentration of $0.020 \text{ mol dm}^{-3}$?

$M_r(\text{Na}_2\text{SO}_4) = 142$

- A. 50
 - B. 400
 - C. 500
 - D. 600
-

The complete combustion of 15.0 cm^3 of a gaseous hydrocarbon **X** produces 60.0 cm^3 of carbon dioxide gas and 75.0 cm^3 of water vapour. What is the molecular formula of **X**? (All volumes are measured at the same temperature and pressure.)

- A. C_4H_6
 - B. C_4H_8
 - C. C_4H_{10}
 - D. C_6H_{10}
-

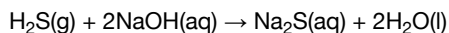
At 25 °C, 200 cm³ of 1.0 mol dm⁻³ nitric acid is added to 5.0 g of magnesium powder. If the experiment is repeated using the same mass of magnesium powder, which conditions will result in the same initial reaction rate?

	Volume of HNO ₃ / cm ³	Concentration of HNO ₃ / mol dm ⁻³	Temperature / °C
A.	200	2.0	25
B.	200	1.0	50
C.	100	2.0	25
D.	100	1.0	25

What is the amount, in moles, of sulfate ions in 100 cm³ of 0.020 mol dm⁻³ FeSO₄(aq)?

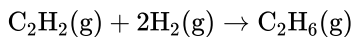
- A. 2.0×10^{-3}
- B. 2.0×10^{-2}
- C. 2.0×10^{-1}
- D. 2.0

Which volume, in cm³, of 0.20 mol dm⁻³ NaOH (aq) is needed to neutralize 0.050 mol of H₂S(g)?



- A. 0.25
- B. 0.50
- C. 250
- D. 500

3.0 dm³ of ethyne, C₂H₂, is mixed with 3.0 dm³ of hydrogen and ignited. The equation for the reaction that occurs is shown below.



Assuming the reaction goes to completion and all gas volumes are measured at the same temperature and pressure, what volume of ethane, C₂H₆, in dm³, is formed?

- A. 1.5
- B. 2.0
- C. 3.0
- D. 6.0

Chloroethene, $\text{C}_2\text{H}_3\text{Cl}$, reacts with oxygen according to the equation below.



What is the amount, in mol, of H_2O produced when 10.0 mol of $\text{C}_2\text{H}_3\text{Cl}$ and 10.0 mol of O_2 are mixed together, and the above reaction goes to completion?

- A. 4.00
 - B. 8.00
 - C. 10.0
 - D. 20.0
-

How many atoms of nitrogen are there in 0.50 mol of $(\text{NH}_4)_2\text{CO}_3$?

- A. 1
 - B. 2
 - C. 3.01×10^{23}
 - D. 6.02×10^{23}
-

Which is a homogeneous mixture?

- A. Oil and water
 - B. Sand and water
 - C. Ethanol and water
 - D. Chalk and sand
-

In a reaction that occurs in 50 g of aqueous solution, the temperature of the reaction mixture increases by 20 °C. If 0.10 mol of the limiting reagent is consumed, what is the enthalpy change (in kJ mol^{-1}) for the reaction? Assume the specific heat capacity of the solution = $4.2\text{kJ}^{-1}\text{K}^{-1}$.

- A. $-0.10 \times 50 \times 4.2 \times 20$
 - B. $-0.10 \times 0.050 \times 4.2 \times 20$
 - C. $\frac{-50 \times 4.2 \times 20}{0.10}$
 - D. $\frac{-0.050 \times 4.2 \times 20}{0.10}$
-

Which factors affect the molar volume of an ideal gas?

- I. Pressure
- II. Temperature
- III. Empirical formula

- A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II and III
-

Which of the following is consistent with Avogadro's law?

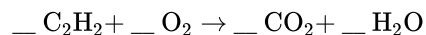
- A. $\frac{P}{T} = \text{constant}$ (V, n constant)
 - B. $\frac{V}{T} = \text{constant}$ (P, n constant)
 - C. $Vn = \text{constant}$ (P, T constant)
 - D. $\frac{V}{n} = \text{constant}$ (P, T constant)
-

Which statements about mixtures are correct?

- I. The components may be elements or compounds.
- II. All components must be in the same phase.
- III. The components retain their individual properties.

- A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II and III
-

What is the sum of all coefficients when the following equation is balanced using the smallest possible whole numbers?



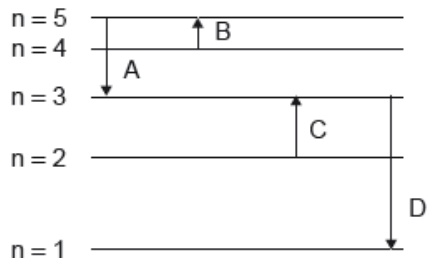
- A. 5
 - B. 7
 - C. 11
 - D. 13
-

Some sodium chloride is dissolved in water. Which term describes the role of sodium chloride in this process?

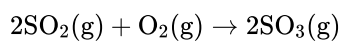
- A. Solute

- B. Solvent
 - C. Solution
 - D. Saturated
-

Which electron transition emits energy of the longest wavelength?



What volume of sulfur trioxide, in cm^3 , can be prepared using 40 cm^3 sulfur dioxide and 20 cm^3 oxygen gas by the following reaction? Assume all volumes are measured at the same temperature and pressure.

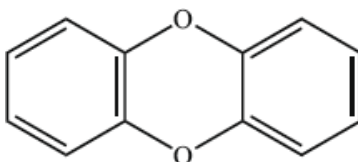


- A. 20
 - B. 40
 - C. 60
 - D. 80
-

7.102 g of Na_2SO_4 ($M = 142.04 \text{ g mol}^{-1}$) is dissolved in water to prepare 0.5000 dm^3 of solution. What is the concentration of Na_2SO_4 in mol dm^{-3} ?

- A. 2.500×10^{-2}
 - B. 1.000×10^{-1}
 - C. 1.000×10
 - D. 1.000×10^2
-

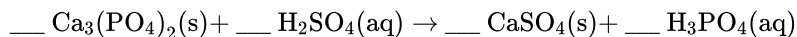
The structural formula of a dioxin is shown below.



What is its empirical formula?

- A. C_6O
 - B. $\text{C}_6\text{H}_4\text{O}$
 - C. $\text{C}_6\text{H}_6\text{O}$
 - D. $\text{C}_{12}\text{H}_8\text{O}_2$
-

What are the coefficients of $\text{H}_2\text{SO}_4(\text{aq})$ and $\text{H}_3\text{PO}_4(\text{aq})$ when the following equation is balanced using the smallest possible whole numbers?

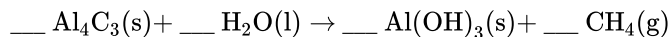


	Coefficient of $\text{H}_2\text{SO}_4(\text{aq})$	Coefficient of $\text{H}_3\text{PO}_4(\text{aq})$
A.	1	2
B.	2	3
C.	3	1
D.	3	2

Which is the best description of relative atomic mass, A_r ?

- A. The number of neutrons and protons present in the nucleus of an atom
 - B. The average number of neutrons and protons in all isotopes of an element
 - C. The weighted mean mass of naturally occurring isotopes of an element compared to the mass of an atom of carbon-12
 - D. The weighted mean mass of naturally occurring isotopes of an element compared to $1/12^{\text{th}}$ of the mass of an atom of carbon-12
-

Aluminium carbide reacts with water according to the equation below. What is the **sum** of all the coefficients when the equation is balanced?



- A. 13
 - B. 14
 - C. 19
 - D. 20
-

Which represents an empirical formula?

- A. C_2H_4
- B. B_2H_6

- C. Al_2O_3
 - D. C_6H_6
-

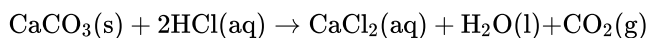
What is the molar mass, in g mol^{-1} , of washing soda crystals, $\text{Na}_2\text{CO}_3 \bullet 10\text{H}_2\text{O}$?

- A. 105.99
 - B. 124.00
 - C. 263.15
 - D. 286.19
-

When 50 cm^3 of a hydrocarbon, C_xH_y , was burned in excess oxygen, 200 cm^3 of carbon dioxide and 250 cm^3 of steam were produced (all volumes were measured under the same conditions). What is the molecular formula of the hydrocarbon?

- A. C_2H_4
 - B. C_3H_8
 - C. C_4H_8
 - D. C_4H_{10}
-

What mass of carbon dioxide, $\text{CO}_2(\text{g})$, in g, is produced when 5.0 g of calcium carbonate, $\text{CaCO}_3(\text{s})$, reacts completely with hydrochloric acid, $\text{HCl}(\text{aq})$?



- A. 0.050
 - B. 2.2
 - C. 4.4
 - D. 5.0
-

Which compound has the highest percentage of carbon by mass?

- A. CH_4
 - B. C_2H_4
 - C. C_4H_{10}
 - D. C_6H_6
-

A gas with a molar mass (M) of 44 g mol^{-1} occupies a volume of $2.00 \times 10^3 \text{ cm}^3$ at a pressure of $1.01 \times 10^5 \text{ Pa}$ and a temperature of 25°C . Which expression is correct for the calculation of the mass of the gas, in g? ($R = 8.31 \text{ J K}^{-1} \text{ mol}^{-1}$)

- A. $\frac{44 \times 1.01 \times 10^5 \times 2.00 \times 10^{-3}}{8.31 \times 298}$
- B. $\frac{44 \times 1.01 \times 10^5 \times 2.00 \times 10^3}{8.31 \times 25}$
- C. $\frac{1.01 \times 10^5 \times 2.00 \times 10^{-3}}{44 \times 8.31 \times 298}$
- D. $\frac{44 \times 1.01 \times 10^5 \times 2.00 \times 10^3}{8.31 \times 298}$
-

Which sample contains the largest amount, in mol, of oxygen atoms?

- A. $0.20 \text{ mol P}_2\text{O}_5$
- B. 0.30 mol O_3
- C. $0.40 \text{ mol CH}_3\text{COOH}$
- D. $0.80 \text{ mol H}_2\text{O}$
-

For which compounds is the empirical formula the same as the molecular formula?

- I. Methane
- II. Ethene
- III. Ethanol
- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II and III
-

Equal masses of the metals Na, Mg, Ca and Ag are added to separate samples of excess HCl (aq). Which metal produces the greatest total volume of $\text{H}_2(\text{g})$?

- A. Na
- B. Mg
- C. Ca
- D. Ag
-

What is the total number of protons and electrons in one mole of hydrogen gas?

- A. 2
 - B. 4
 - C. 1.2×10^{24}
 - D. 2.4×10^{24}
-

Which solution contains the biggest amount, in mol, of chloride ions?

- A. 20 cm³ of 0.50 mol dm⁻³ NH₄Cl
 - B. 60 cm³ of 0.20 mol dm⁻³ MgCl₂
 - C. 70 cm³ of 0.30 mol dm⁻³ NaCl
 - D. 100 cm³ of 0.30 mol dm⁻³ ClCH₂COOH
-

8.5 g of NH₃ are dissolved in H₂O to prepare a 500 cm³ solution. Which statements are correct?

- I. NH₃ is the solute and H₂O is the solution
 - II. The concentration of the solution is 17 g dm⁻³
 - III. [NH₃] = 1.0 mol dm⁻³
- A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II and III
-

Which compound has the empirical formula with the largest mass?

- A. C₂H₆
 - B. C₂H₄
 - C. C₂H₂
 - D. C₃H₆
-

Which statements are correct about Avogadro's constant?

- I. It is the number of ions in 12 g of sodium hydride, NaH.
- II. It is the number of molecules in 22.4 dm³ of hydrogen gas at 0 °C and 1 atm.
- III. It is the number of atoms in 12 g of ¹²C.

- A. I and II only

- B. I and III only
 - C. II and III only
 - D. I, II and III
-

Which molecular formula is also an empirical formula?

- A. PCl_3
 - B. C_2H_4
 - C. H_2O_2
 - D. $\text{C}_6\text{H}_{12}\text{O}_6$
-

At which temperature, in K, assuming constant pressure, is the volume of a fixed mass of gas at 127°C doubled?

- A. 200 K
 - B. 254 K
 - C. 400 K
 - D. 800 K
-

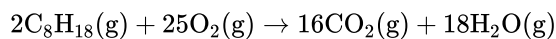
What is the maximum mass, in g, of magnesium oxide that can be obtained from the reaction of oxygen with 2.4 g of magnesium?

- A. 2.4
 - B. 3.0
 - C. 4.0
 - D. 5.6
-

What is the mass, in g, of one molecule of ethane, C_2H_6 ?

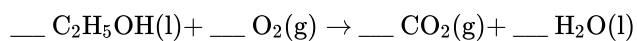
- A. 3.0×10^{-23}
 - B. 5.0×10^{-23}
 - C. 30
 - D. 1.8×10^{25}
-

What volume of carbon dioxide, $\text{CO}_2(\text{g})$, in dm^3 , is produced when 1 dm^3 of octane, $\text{C}_8\text{H}_{18}(\text{g})$, undergoes complete combustion?



- A. 1
 - B. 4
 - C. 8
 - D. 9
-

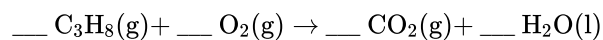
Combustion of ethanol takes place according to the following unbalanced equation.



What is the mole ratio of ethanol to oxygen in the balanced equation?

- A. 1:1
 - B. 2:1
 - C. 1:3
 - D. 2:7
-

What is the sum of all coefficients for the combustion of one mole of propane?



- A. 8
 - B. 12
 - C. 13
 - D. 15
-

What is the mass, in g, of one mole of hydrated copper(II) sulfate, $\text{CuSO}_4 \bullet 5\text{H}_2\text{O}$, given the following relative atomic mass values?

Element	Cu	S	H	O
Relative atomic mass	64	32	1	16

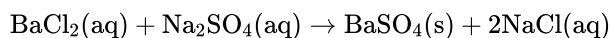
- A. 160
 - B. 178
 - C. 186
 - D. 250
-

A hydrocarbon contains 85.7 % carbon by mass. What is the empirical formula of the hydrocarbon?

- A. C_2H_3
- B. CH_2

- C. C_2H_5
 - D. CH_3
-

100.0 cm^3 of a 0.50 mol dm^{-3} solution of BaCl_2 is added to 50.0 cm^3 of a 0.10 mol dm^{-3} solution of Na_2SO_4 . A precipitate of BaSO_4 is formed according to the equation below.



What is the amount, in mol, of BaSO_4 produced?

- A. 0.0050
 - B. 0.010
 - C. 0.050
 - D. 0.10
-

0.040 mol of $(\text{NH}_4)_2\text{Ni}(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$ is dissolved in water to give 200 cm^3 of aqueous solution. What is the concentration, in mol dm^{-3} , of ammonium ions?

- A. 0.00040
 - B. 0.0080
 - C. 0.20
 - D. 0.40
-

What is the pressure, in Pa, if 3 mol of gas occupies 500 cm^3 at 25 $^\circ\text{C}$?

Given: $R = 8.31 \text{ J K}^{-1}\text{mol}^{-1}$

$$10^{-3} \text{ m}^3 = 10^3 \text{ cm}^3$$

- A. $\frac{3 \times 8.31 \times 298}{500}$
 - B. $\frac{3 \times 8.31 \times 25}{0.0005}$
 - C. $\frac{3 \times 8.31 \times 25}{500}$
 - D. $\frac{3 \times 8.31 \times 298}{0.0005}$
-

Which volumes of gases at standard temperature and pressure have the same mass as 100 cm^3 of O_2 ?

- I. 50 cm^3 of SO_2
- II. 100 cm^3 of CH_4
- III. 100 cm^3 of SiH_4

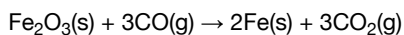
- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II and III

For which compound is the empirical formula the same as the molecular formula?

$$A_r(\text{H})=1; A_r(\text{C})=12; A_r(\text{O})=16$$

	Empirical formula	Molar mass / g mol^{-1}
A.	CO_2H	90
B.	CH_3O	62
C.	$\text{C}_2\text{H}_4\text{O}$	88
D.	$\text{C}_4\text{H}_8\text{O}$	72

5.0mol of $\text{Fe}_2\text{O}_3(\text{s})$ and 6.0mol of $\text{CO}(\text{g})$ react according to the equation below. What is the limiting reactant and how many moles of the excess reactant remain unreacted?



	Limiting reactant	Moles of excess reactant remaining
A.	CO	2.0
B.	CO	3.0
C.	Fe_2O_3	1.0
D.	Fe_2O_3	2.0